

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Priority Application Serial No. 09/457,206
Priority Filing Date 12/7/99
Inventor G.S. Sandhu et al.
Assignee Micron Technology, Inc.
Priority Group Art Unit 2812
Priority Examiner Richard A. Booth
Attorney's Docket No. MI22-1685
Title: Method of Forming a Thin Film Transistor

PRELIMINARY AMENDMENT

To: Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

From: David G. Latwesen, Ph.D. (Tel. 509-624-4276; Fax 509-838-3424)
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Spokane, WA 99201-3828

AMENDMENTS

In the Specification

At p. 1, before the "Technical Field" section insert:

-- RELATED PATENT DATA

This patent is a continuation application of U.S. Patent Application Serial No. 09/457,206 which was filed on December 7, 1999, which is a continuation of U.S. Patent No. 6,001,675, issued on December 14, 1999, which is a continuation of U.S. Patent No. 5,665,611, which was issued on September 9, 1997--.

In the Claims

Please replace the claims with the following clean version of the entire set of pending claims, in accordance with 37 C.F.R. § 1.121(c)(1)(i). Cancel all previous versions of any pending claim.

A marked up version showing amendments to any claims being changed is provided in one or more accompanying pages separate from this amendment in accordance with 37 C.F.R. § 1.121(c)(1)(ii). Any claim not accompanied by a marked up version has not been changed relative to the immediate prior version, except that marked up versions are not being supplied for any added claim or canceled claim.

Cancel claims 1-32.

Add new claims 33-42.

33. A method of forming a thin film transistor comprising the following steps:

forming a polycrystalline thin film transistor layer and defining a channel region within the polycrystalline thin film transistor layer;

forming a fluorine containing layer proximate the polycrystalline thin film transistor layer;

transferring fluorine into the polycrystalline thin film transistor layer from the fluorine containing layer to form Si-F bonds within the channel region of the polycrystalline thin film transistor layer; and

forming a transistor gate proximate the channel region.

34. The method of claim 33 wherein the transistor gate is formed after forming the fluorine containing layer.

35. The method of claim 33 wherein the transistor gate is formed before forming the polycrystalline thin film transistor layer.

36. The method of claim 33 wherein the transistor gate is formed after forming the polycrystalline thin film transistor layer.

37. A method of forming a bottom-gated thin film transistor comprising the following steps:

forming a transistor gate;

forming a polycrystalline thin film transistor layer over the transistor gate;

forming a fluorine containing layer proximate the polycrystalline thin film transistor layer; and

transferring fluorine into the polycrystalline thin film transistor layer from the fluorine containing layer.

38. The method of claim 37 wherein the polycrystalline thin film transistor layer comprises silicon.

39. A method of forming a thin film transistor comprising the following steps:

providing a substrate;

forming an insulative material over the substrate;

forming a polycrystalline thin film layer over the insulative material;

forming a sacrificial fluorine containing layer on the polycrystalline thin film layer by chemical vapor deposition utilizing WF_6 and SiH_4 precursors;

transferring fluorine from the sacrificial fluorine containing layer into the polycrystalline thin film layer to form Si-F bonds within the polycrystalline thin film layer;

after transferring fluorine from the sacrificial fluorine containing layer, removing the sacrificial layer from on the polycrystalline thin film layer; and

after removing the sacrificial layer, forming a transistor gate operatively proximate the thin film transistor layer.

40. The method of forming a thin film transistor of claim 39 wherein the polycrystalline thin film layer is provided before the fluorine containing layer is provided.

41. The method of forming a thin film transistor of claim 39 wherein the polycrystalline thin film layer comprises silicon.

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42. A method of forming a thin film transistor, comprising:

forming a thin film transistor layer of material on an insulative layer; the material comprising one or both of germanium and silicon, and comprising grain boundaries;

forming a sacrificial fluorine containing layer over the thin film transistor layer by chemical vapor deposition utilizing WF_6 and SiH_4 precursors;

driving fluorine from the fluorine containing layer into the thin film transistor layer to incorporate fluorine within the grain boundaries;

after the driving, removing the sacrificial layer from over the thin film transistor layer; and

incorporating dopants within the thin film transistor layer to dope the thin film transistor layer.

REMARKS

Claims 1-32 are cancelled, and claims 33-42 are added. Claims 33-42 are pending in the application, and Applicant requests examination of such pending claims.

Respectfully submitted,

Dated: 4/17/01 By: 

David G. Latwesen, Ph.D.
Reg. No. 38,533

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Priority Application Serial No. 09/837,645
Priority Filing Date April 17, 2001
Inventor Sandhu et al.
Assignee Micron Technology, Inc.
Priority Group Art Unit 2813
Priority Examiner Schillinger, L.
Attorney's Docket No. MI22-1780
Title: Methods of Forming a Thin Film Transistor

PRELIMINARY AMENDMENT

To: BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

From: Jennifer J. Taylor, Ph.D. (Tel. 509-624-4276; Fax 509-838-3424)
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AMENDMENTS

In the Specification

At p. 1, before the "Technical Field" Section, insert

--RELATED PATENT DATA

This patent is a divisional application of U.S. Patent Application Serial No. 09/837,645 which was filed on April 17, 2001, which is a continuation of U.S. Patent No. 6,238,957, issued on May 29, 2001, which is a continuation of U.S. Patent No. 6,001,675, issued on December 14, 1999, which is a continuation of U.S. Patent No. 5,665,611, which was issued on September 9, 1997.--

In the Claims

A marked up version showing amendments to any claims being changed is provided in one or more accompanying pages separate from this amendment in accordance with 37 C.F.R. § 1.121(c)(1)(ii). Any claim not accompanied by a marked up version has not been changed relative to the immediate prior version, except that marked up versions are not being supplied for any canceled claim.

Cancel claims 1-36 and 39-42.

Please add claims 43-45 as follows:

43. (New) The method of claim 37 wherein the forming a fluorine containing layer comprises forming a sacrificial fluorine containing layer over the thin film transistor layer by chemical vapor deposition utilizing WF₆ and SiH₄ precursors.

44. (New) The method of claim 43 further comprising, after the transferring fluorine, removing the sacrificial layer from over the thin film transistor layer.

45. (New) A method of forming a bottom-gated thin film transistor comprising the following steps:

forming a transistor gate;

forming a polycrystalline thin film transistor layer over the transistor gate;

forming a fluorine containing layer over the polycrystalline thin film transistor layer;

providing a buffering layer intermediate the thin film transistor layer and the fluorine containing layer; and

transferring fluorine into the polycrystalline thin film transistor layer from the fluorine containing layer.

REMARKS

Claims 1-36 and 39-42 are cancelled; claims 43-45 are added; claims 37-38 and 43-45 are pending in the application. Applicant requests examination of the pending claims.

The added claims 43-45 are fully supported by the specification. With respect to claim 43, support for the claimed subject matter is found in the specification at page 9, lines 13-15. With respect to claim 44, the subject matter claimed is supported by the specification at page 11, lines 3-7. With respect to claim 45, the subject matter claimed is supported by the specification at page 13, lines 11-13.

Respectfully submitted,

Dated: July 9, 2001

By: Jennifer J. Taylor
Jennifer J. Taylor, Ph.D.
Reg. No. P-48,711

Priority Application Serial No. 09/837,645
Priority Filing Date April 17, 2001
Inventor Sandhu et al.
Assignee Micron Technology, Inc.
Priority Group Art Unit 2813
Priority Examiner Schillinger, L.
Attorney's Docket No. MI22-1780
Title: Methods of Forming a Thin Film Transistor

VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING
PRELIMINARY AMENDMENT

In the Specification

The replacement specification paragraphs incorporate the following amendments. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

At p. 1, before the "Technical Field" Section, insert

RELATED PATENT DATA

This patent is a divisional application of U.S. Patent Application Serial No. 09/837,645 which was filed on April 17, 2001, which is a continuation of U.S. Patent No. 6,238,957, issued on May 29, 2001, which is a continuation of U.S. Patent No. 6,001,675, issued on December 14, 1999, which is a continuation of U.S. Patent No. 5,665,611, which was issued on September 9, 1997.

In the Claims

The claims have been amended as follows. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

Claims 1-36 and 39-42 are cancelled.

The following claims are added:

43. (New) The method of claim 37 wherein the forming a fluorine containing layer comprises forming a sacrificial fluorine containing layer over the thin film transistor layer by chemical vapor deposition utilizing WF₆ and SiH₄ precursors.

44. (New) The method of claim 43 further comprising after the transferring fluorine, removing the sacrificial layer from over the thin film transistor layer.

45. (New) A method of forming a bottom-gated thin film transistor comprising the following steps:

forming a transistor gate;

forming a polycrystalline thin film transistor layer over the transistor gate;

forming a fluorine containing layer over the polycrystalline thin film transistor layer;

providing a buffering layer intermediate the thin film transistor layer and the fluorine containing layer; and

transferring fluorine into the polycrystalline thin film transistor layer from the fluorine containing layer.

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